

Hella Accelerator Pedal Sensors

December 2008



*Ideas today for
the cars of tomorrow*

Hella Accelerator Pedal Sensors

§ Hella Accelerator Pedal Sensors

§ Basics

§ Working principle

§ Current Truck Applications

§ Technical Data



Sensors for X-By-Wire-Systems – Position sensors

Hella Accelerator Pedal Roadmap

Continuous Development and Improvement

- § Simplification of design, assembly and installation technologies
- § Increasing share of CIPOS (Contactless Inductive Position Sensor) technology
- § Integration of functions in subcomponents
- § Optimization of installation space
- § Cost optimization

SOP 1996
1.Gen., Side Lever,
Potentiometer



SOP 2001
1.Gen., Side
Lever, CIPOS



SOP 2001
2.Gen., Mid Lever,
Potentiometer



SOP 2002
Floor Mounted,
1.Gen., CIPOS



SOP 2003
2.Gen., Mid Lever,
CIPOS



SOP 2005
3.Gen., Opt.
Package, CIPOS



SOP 2006
Floor Mounted
2.Gen., CIPOS



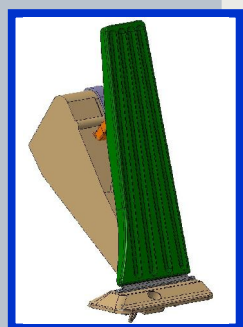
SOP 2007
4.Gen, Opt.
Package, Pot.



SOP 2010
5.Gen., Opt.
Package, CIPOS



SOP 2011
Floor Mounted
3.Gen., CIPOS



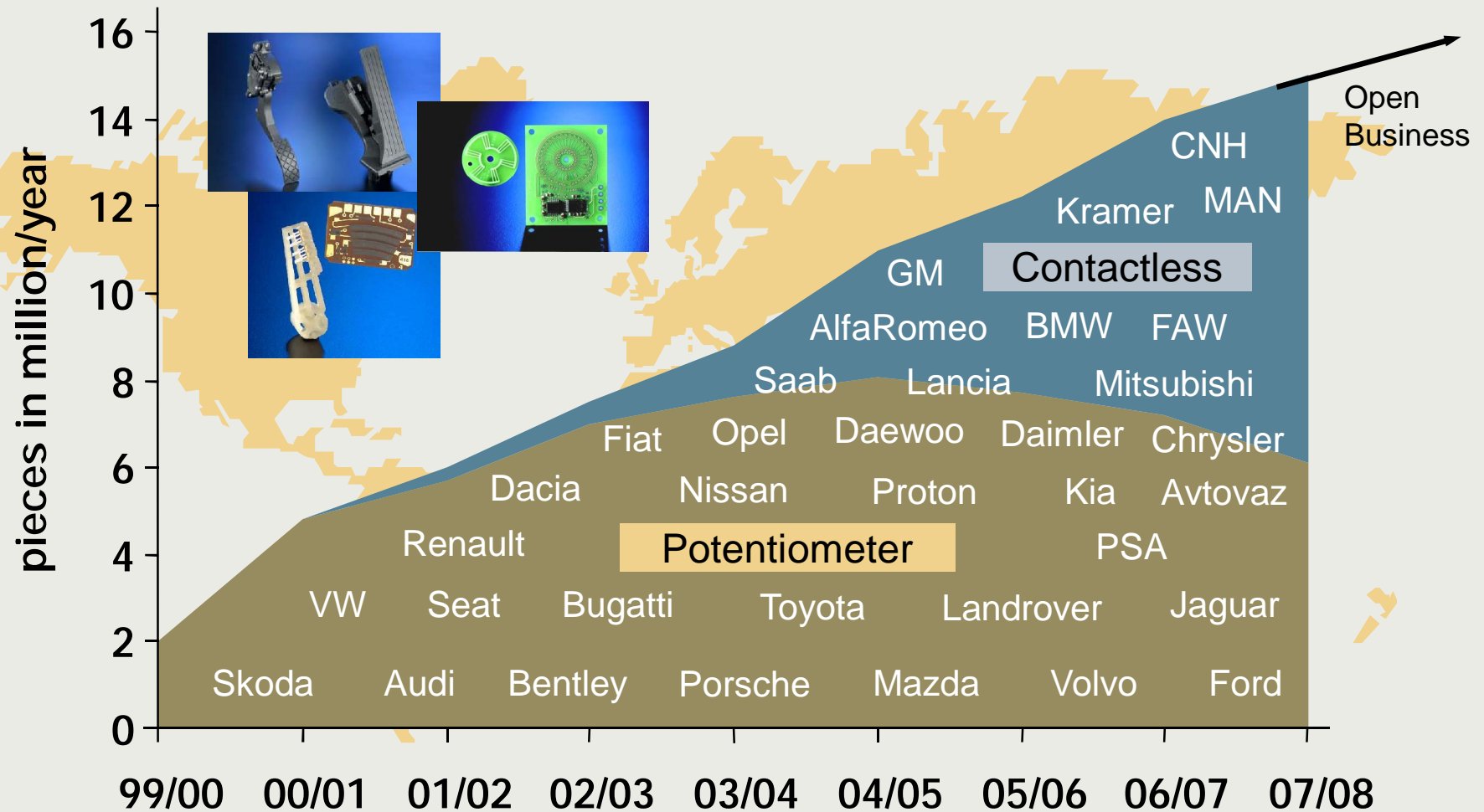
1996

2003

2011

Accelerator Pedal Sensors Hella

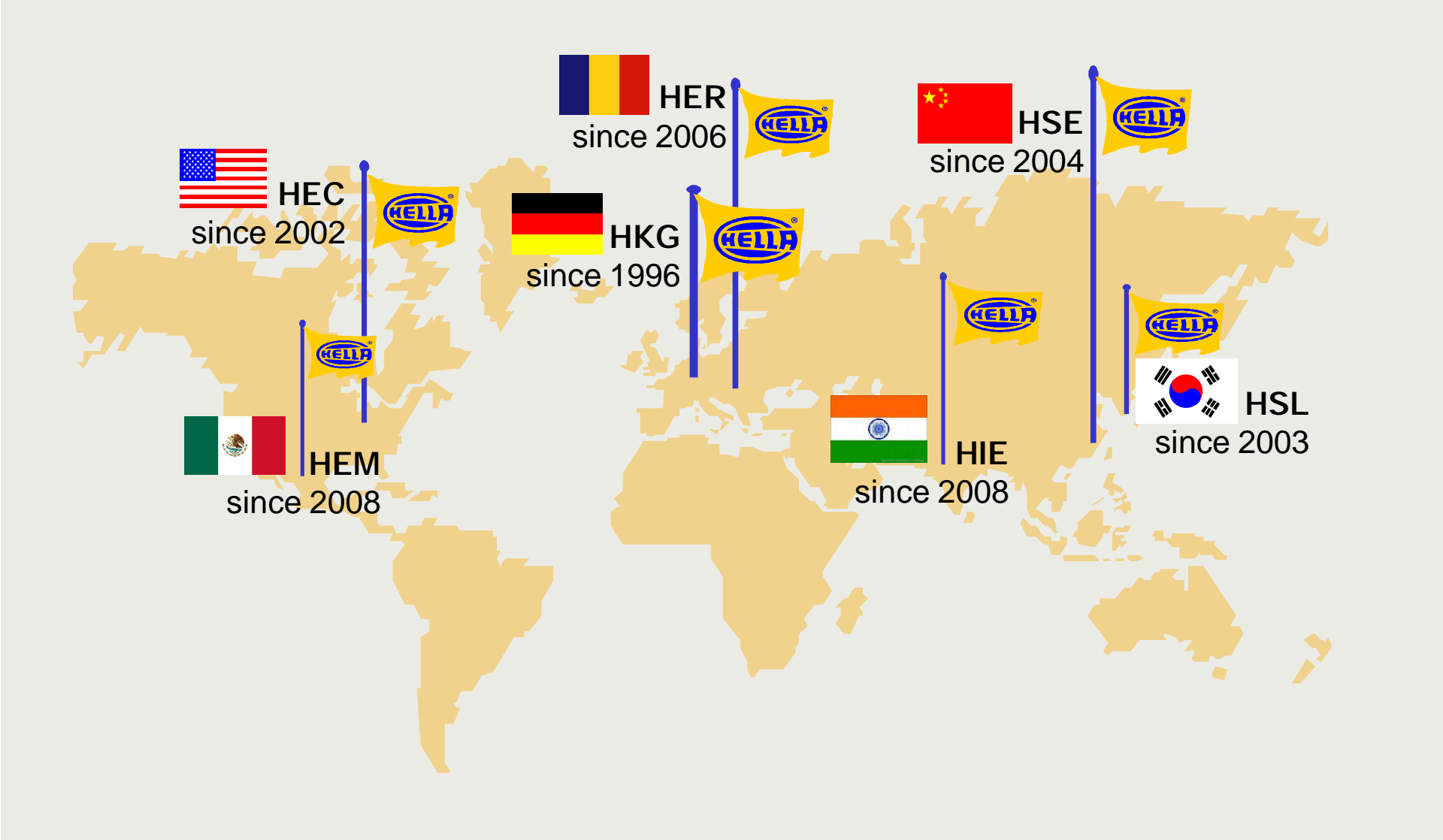
Worldwide Booked Business



=> This year Hella delivers its APS n° 100.000.000 !

Accelerator Pedal Sensors Hella

APS Production and/or Development Locations



Hella Accelerator Pedal Sensors

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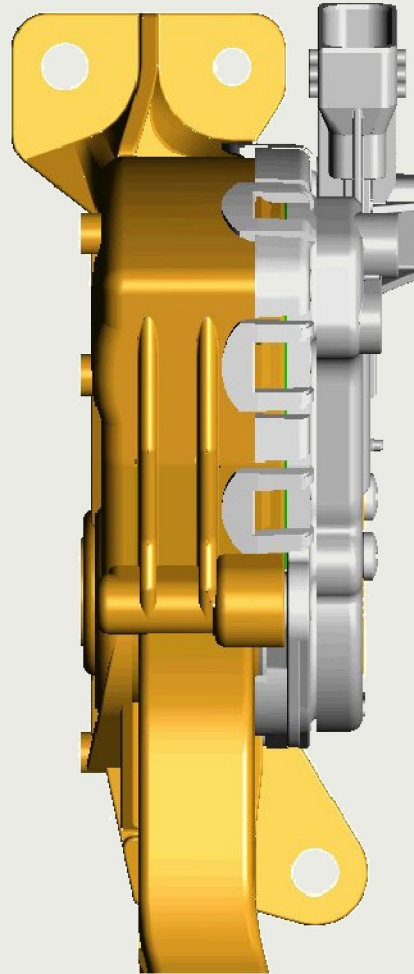
§ Technical Data



Hella Accelerator Pedal Sensors

Basics – Hella APS Technology – Integrated Modular Design

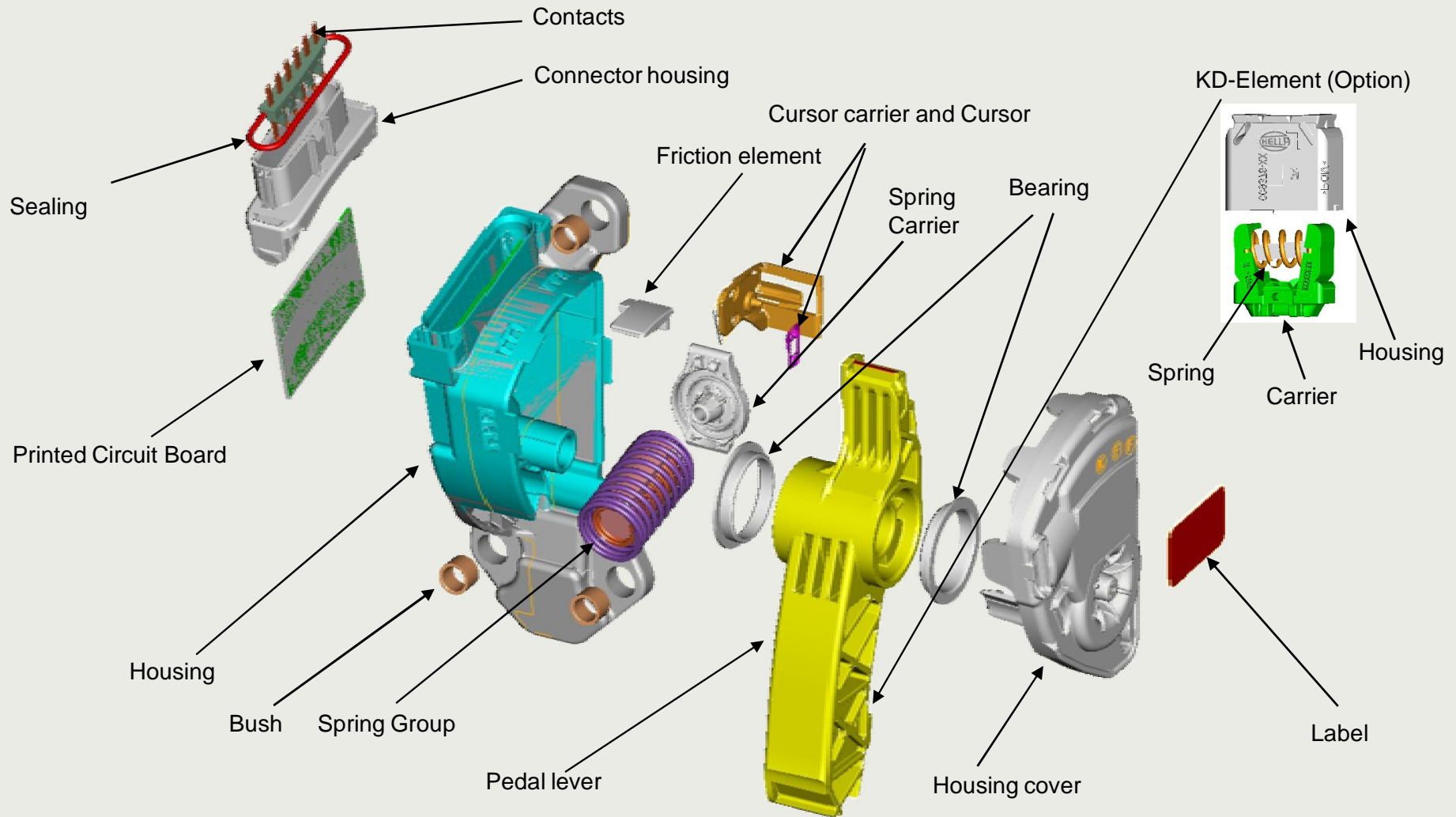
Mechanical Module



Sensor Module

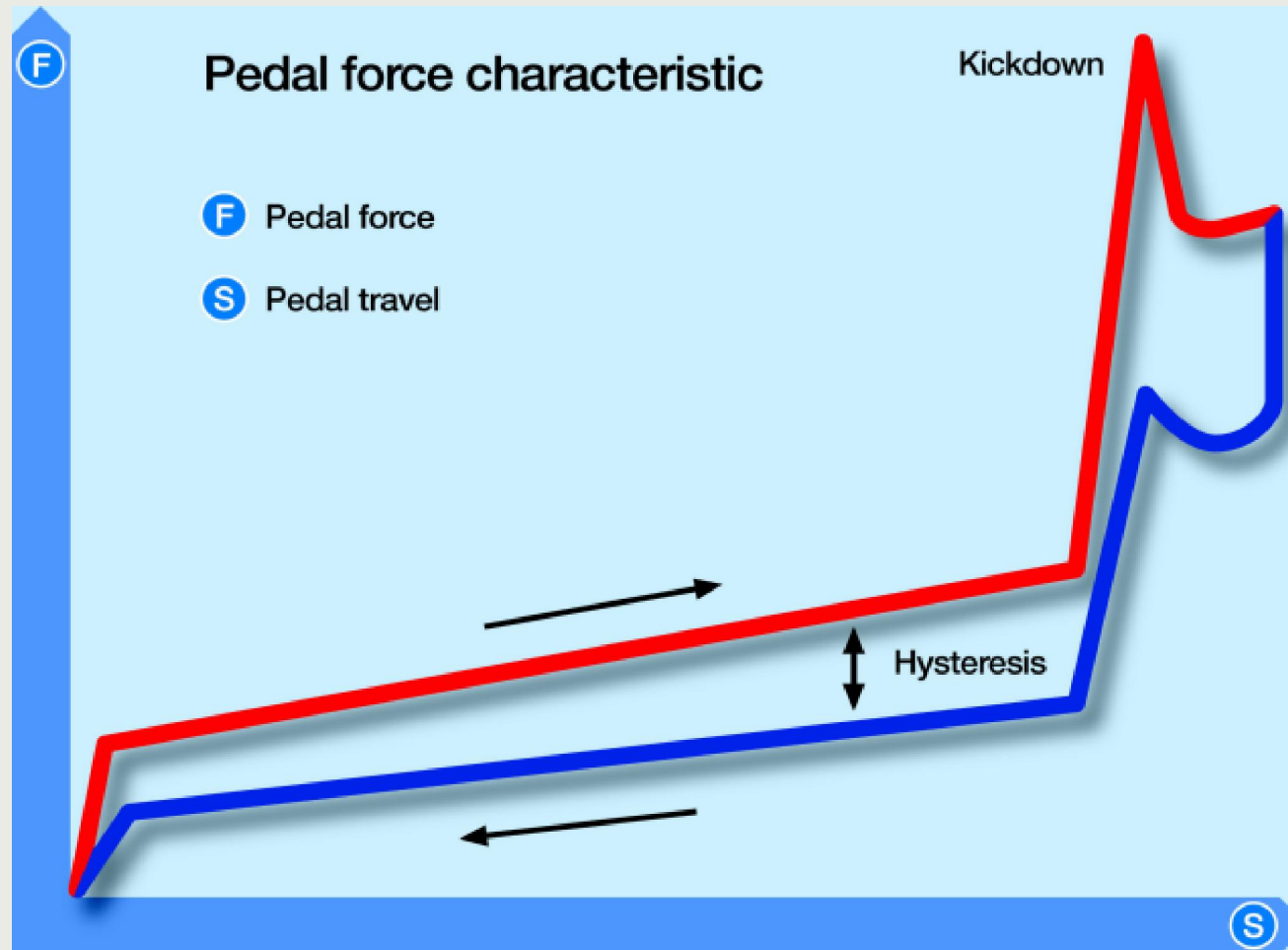
Hella Accelerator Pedal Sensors

Working Principle - Single Parts 3. Gen. APS with CIPOS



Hella Accelerator Pedal Sensors

Working Principle - Pedal force characteristic

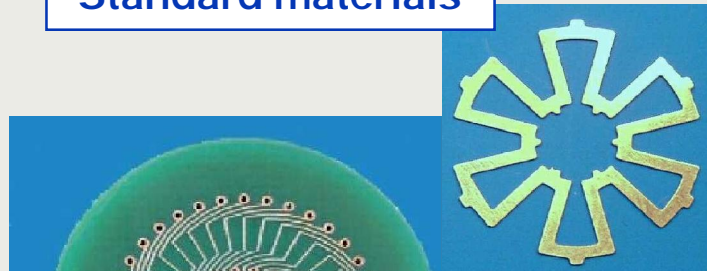


Hella Accelerator Pedal Sensors

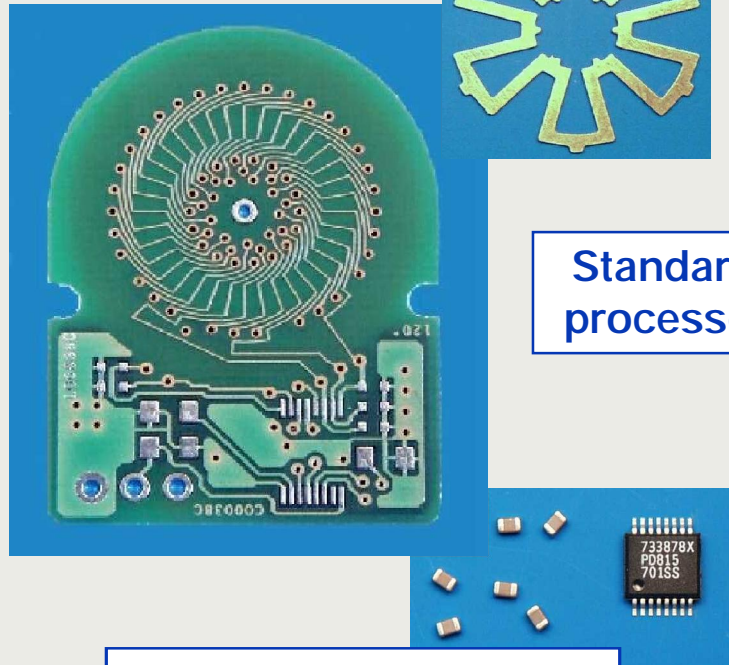
Working Principle - Contact Less Inductive Position Sensors

Robust design using:

Standard materials

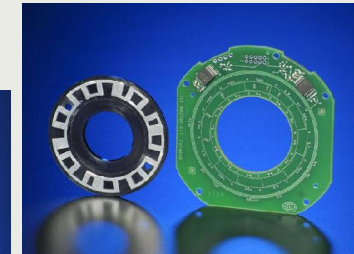
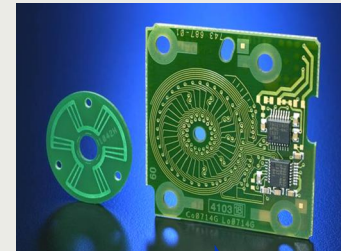


Standard processes

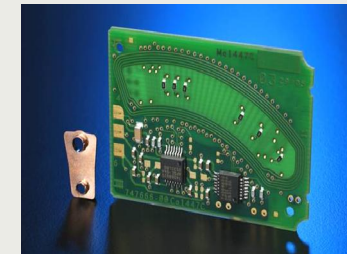


Standard components

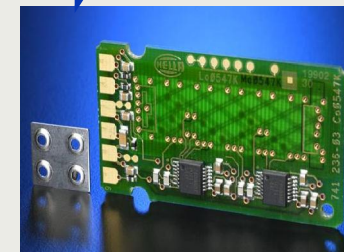
Angle Sensor
(10° to 360°; Multi-turn)



High Flexibility
for various
applications



Segment Sensor
(up to 110°)

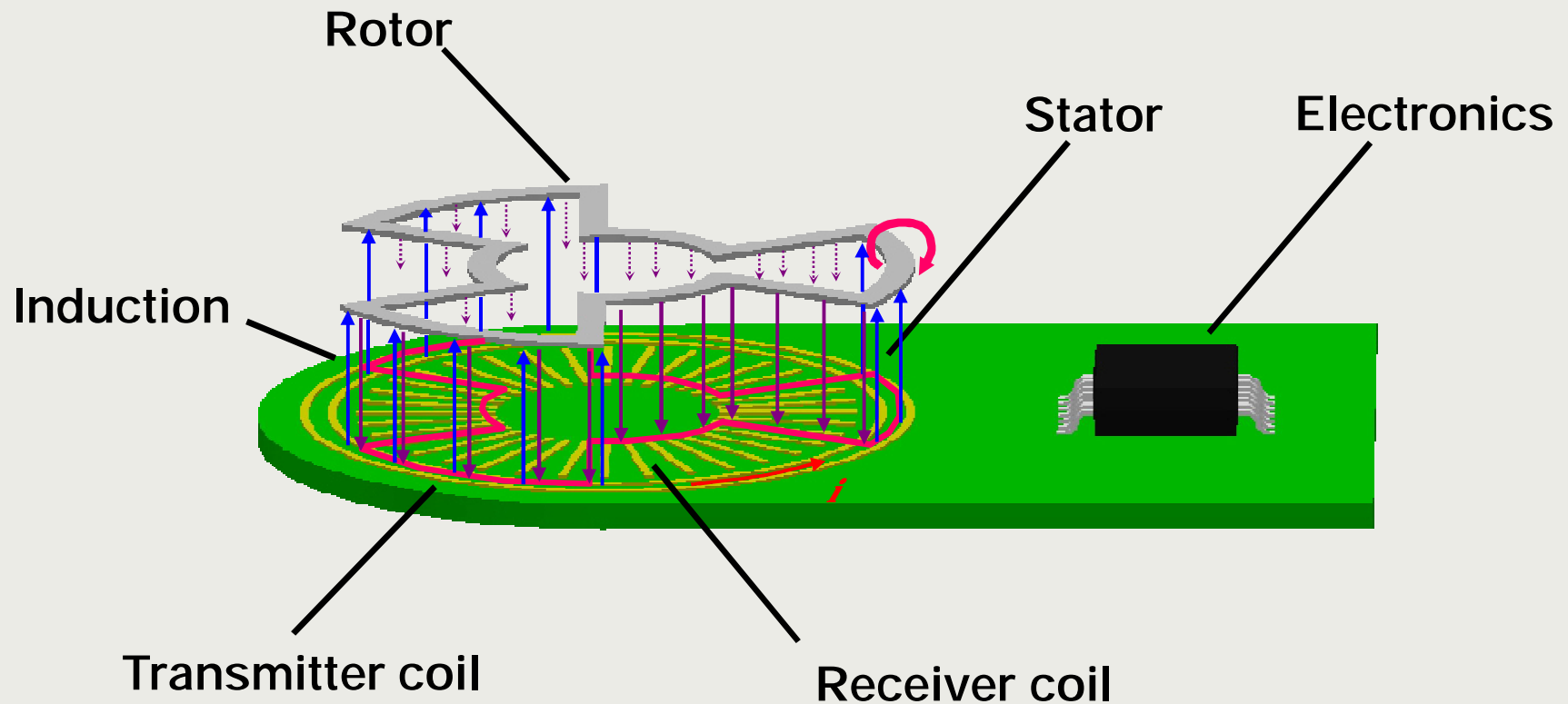


Linear Sensor
(8mm – 70mm and more)

Hella Accelerator Pedal Sensors

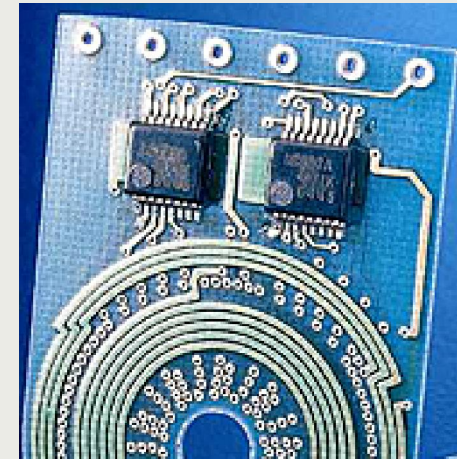
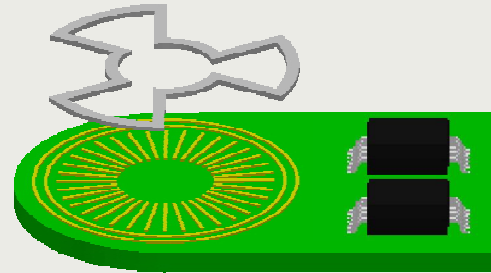
Working Principle - Contact Less Inductive Position Sensors

Basic signal path:



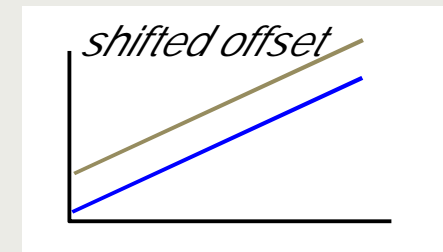
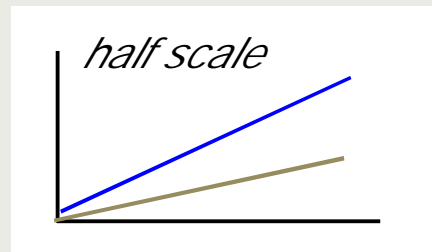
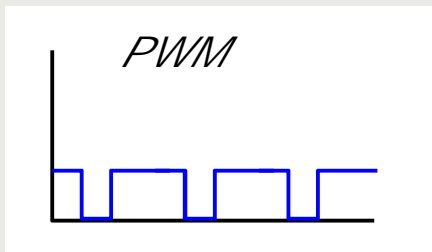
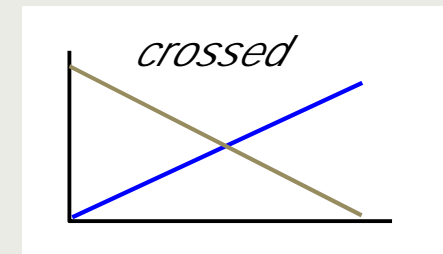
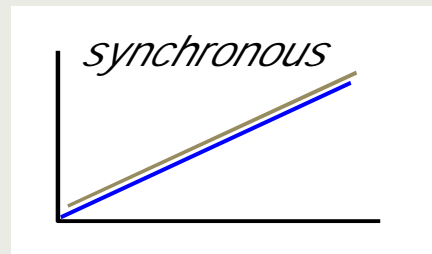
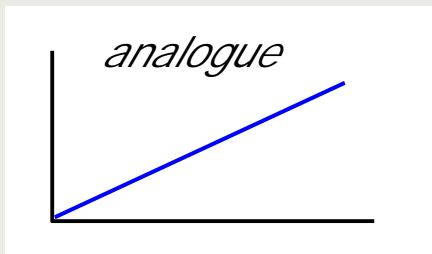
Accelerator Pedal Sensors Hella

Hella APS Signals – Customer Adapted Output Possible



Output Signal
Characteristic

2 Channels
=>
Redundant
Signals



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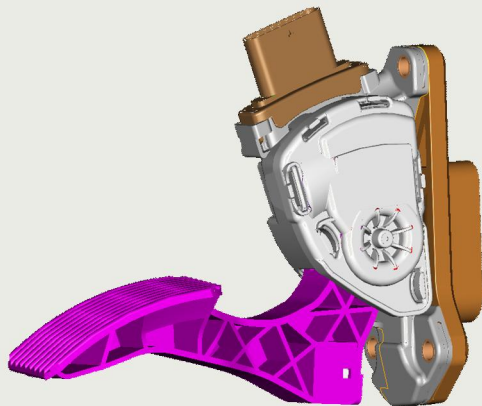
Hella Accelerator Pedal Sensors

Current Products for Truck – Using Contact Less Inductive Sensors

APS 3. Generation Truck Series Applications:

*Suspended, Truck
SOP 3^d Q 2007*

*Actually produced in Romania
with > 100.000 pedals p.a. for MAN*



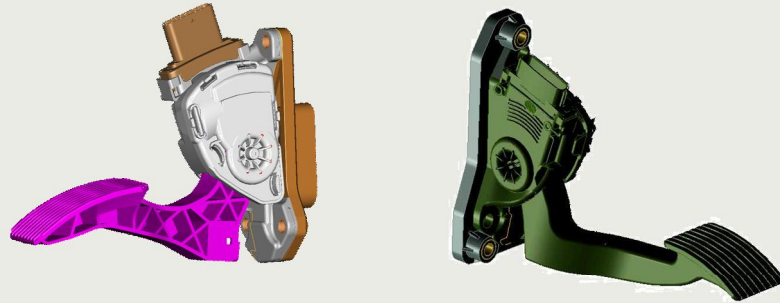
*Suspended, Truck
SOP 4th Q 2006*

*Actually produced in Germany
with > 5.000 pedals p.a. for FAW*



Hella Accelerator Pedal Sensors

Heavy Duty Suspended Pedal - Customer Benefits



Description

- § Fusion of basic mechanical concepts and Hella sensor technology
- § Contactless/ Wear-free measuring
- § Redundant system
- § Customer specific sensor programming
- § Temperature range from – 40 °C to + 85 °C

Customer Benefits

- § Contactless measurement with CIPOS (Contactless Inductive Position Sensor)
- § Robust against mechanical tolerances
- § High accurate system
- § Robust against magnetic / electromagnetic fields
- § No ECU parameter settings for Accelerator Pedal necessary during vehicle production
- § Applicable to customer needs

Application Fields

- § Medium Commercial Vehicles
- § Heavy Commercial Vehicles

Hella Accelerator Pedal Sensors

Heavy Duty Floor Mounted Pedal - Customer Benefits



SOP: 2008

Description

- § APS with integrated CIPOS technology
- § Customer sensor programming
- § Electronically redundant system
- § Kick down function available
- § Temperature range from – 40 °C to + 85 °C

Customer Benefits

- § Contactless measurement with CIPOS (Contactless Inductive Position Sensor)
- § Robust against mechanical tolerances
- § High resolution
- § Robust against magnetic / electromagnetic fields
- § Available as of-the-shelf part

Application Fields

- § Trucks
- § Buses
- § Construction machines

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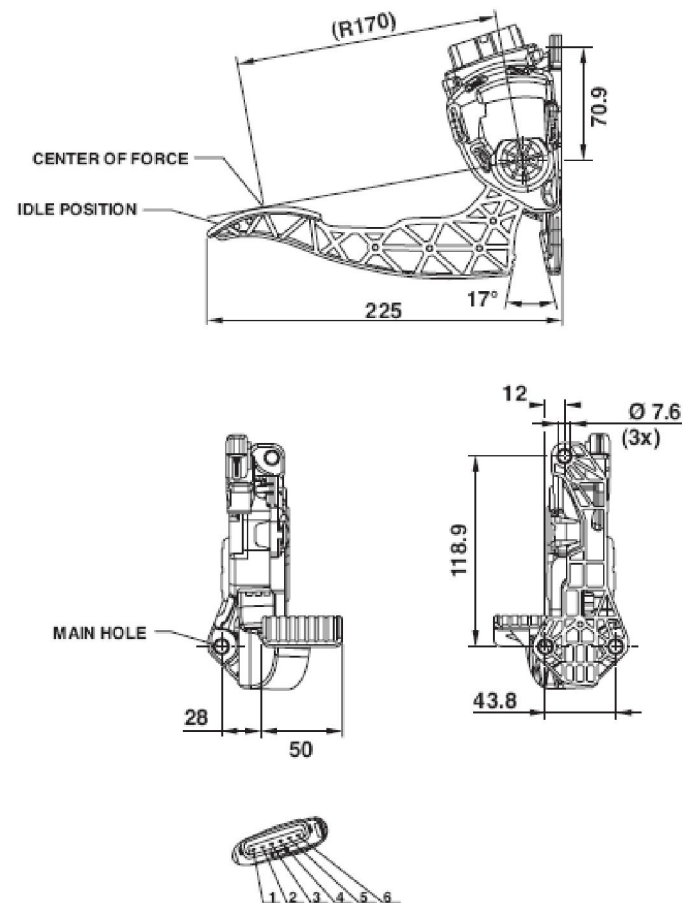
Hella Accelerator Pedal Sensors

Heavy Duty Suspended Pedal - Technical Data (deliverable of the shelf)

Technical data	
Operating voltage	5 V ± 6 %
Current consumption per channel	max. 10 mA
Excess voltage resistance, duration $t \rightarrow \infty$	16 V
Initial force	24 N
Final force	42 N
Actuation angle	17°
Resolution	0.04°
Output signal	2 x analogue ratiometric, 2nd channel half scale
Linearity	≤ 1,5 %
Synchronisation	≤ 3 %
Idling voltage 1	10 % / 5%
Full throttle voltage	90 % / 45 %
Load resistance	typ. 5 kΩ to 100 kΩ
Load capacity	max. 100 nF
Filter constant in the control unit	1 ms ± 5 %
Signal output current	max. 1 mA
Operating temperature	- 40 °C to + 85 °C
Storage temperature	- 40 °C to + 105 °C
Protective rating (electronic)	IP6K9K
Housing material	PA, PBT; GF 30 to GF 50
Counterplug ¹⁾	Yazaki 7283-1968-30
Weight	≤ 400 g
Vibration resistance	4.4 g
Actuations	min. 3.5 million
EMC	CISPR 25, Class 5; electrical and magnetic fields
ESD	4 kV, 8 kV, 15 kV

1) This accessory is not part of the scope of supply.
To be purchased from Yazaki.
Gold-plated contacts and the individual wire seal are required.

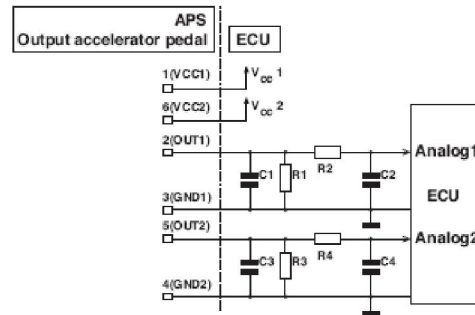
Technical drawing



Hella Accelerator Pedal Sensors

Heavy Duty Suspended Pedal - Technical Data (deliverable of the shelf)

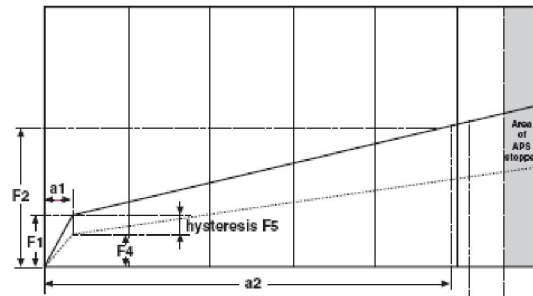
Recommended circuit in the control unit



Pin assignment

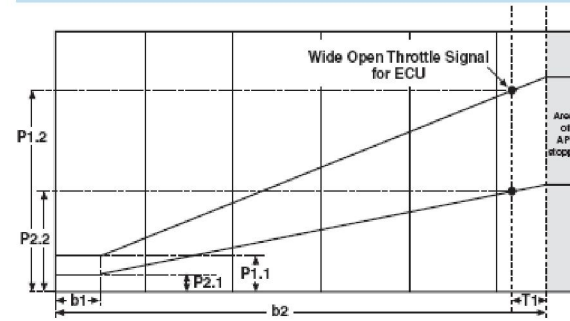
- Pin 1: 5 V supply: sensor 1
- Pin 2: Analogue signal: sensor 1
- Pin 3: Ground: sensor 1
- Pin 4: Ground: sensor 2
- Pin 5: Analogue signal: sensor 2
- Pin 6: 5 V supply: sensor 2

Mechanical characteristic curve



		Rated values
R	/[mm]	170.0
F1	/[N]	24.0 ± 6.0
F2	/[N]	42.0 ± 8.0
F4	/[N]	> 5.0
F5	/[N]	> 4.0
a1	/[degrees]	< 1.2
a2	/[degrees]	15.5

Electrical characteristic curve



		Rated values
b2	/[grad]	17.0 ± 1.2
P1.1	/[%]	10.0 ± 1.0
P2.1	/[%]	5.0 ± 1.0
P1.max	/[%]	< 90.0
P2.max	/[%]	< 45.0
P1.2	/[%]	84.0
P2.2	/[%]	42.0
T1	/[degrees]	< 2.0
b1	/[degrees]	< 1.5

Hella Accelerator Pedal Sensors

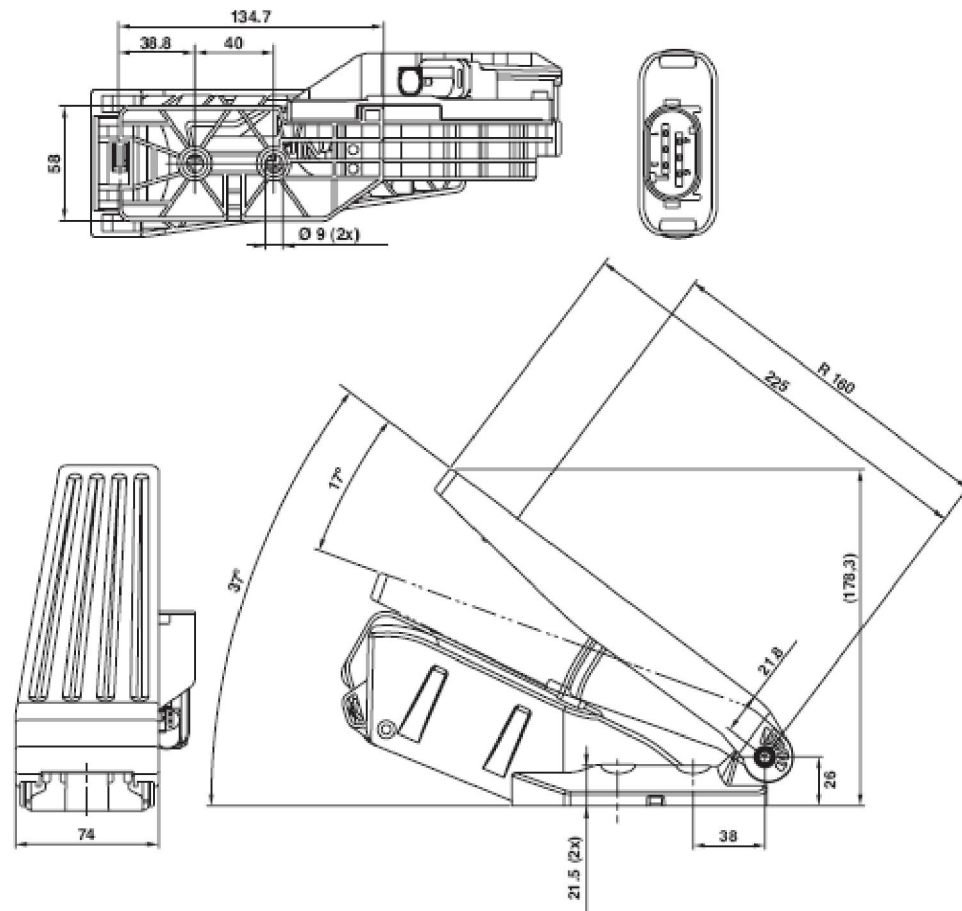
Heavy Duty Floor Mounted Pedal – Technical Data (deliverable of the shelf)

Technical data

Operating voltage	5 V \pm 6 %
Current consumption per channel	max. 10 mA
Excess voltage resistance, duration $t \rightarrow \infty$	16 V
Initial force	15 N
Final force	25 N
Actuation angle	17°
Resolution	0.04°
Output signal	2 x analogue ratiometric, 2nd channel half scale
Linearity	\leq 1.5 %
Synchronisation	\leq 3 %
No-load voltage	15 % / 7,5 %
Full load voltage	80 % / 40 %
Load resistance	typ. 5 k Ω to 100 k Ω
Load capacity	max. 100 nF
Filter constant in the control unit	1 ms \pm 5 %
Signal output current	max. 1 mA
Operating temperature	- 40 °C to + 85 °C
Storage temperature	- 40 °C to + 105 °C
Protective rating (electronic)	IP6K9K
Housing material	PBT, PP GF30; PA GF40
Counterplug ¹⁾	AMP 1-987616-1
Weight	\leq 500 g
Vibration resistance	4.4 g
Actuations	min. 3.5 million
EMC	CISPR 25, Class 5; electrical and magnetic fields
ESD	4 kV, 8 kV, 15 kV

1) This accessory is not part of the scope of supply.
To be purchased from Tyco Electronics
Gold-plated contacts and the individual wire seal are required.

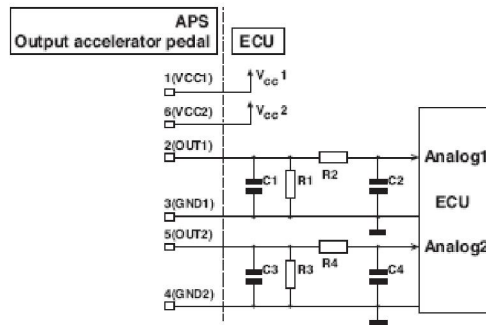
Technical drawing



Hella Accelerator Pedal Sensors

Heavy Duty Floor Mounted Pedal – Technical Data (deliverable of the shelf)

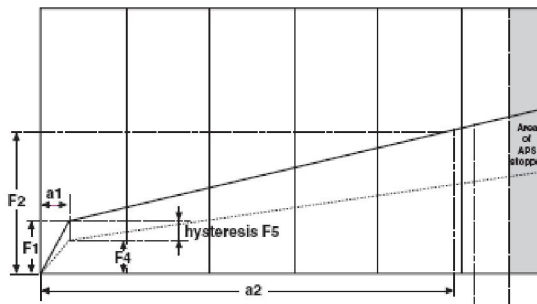
Recommended circuit in the control unit



Pin assignment

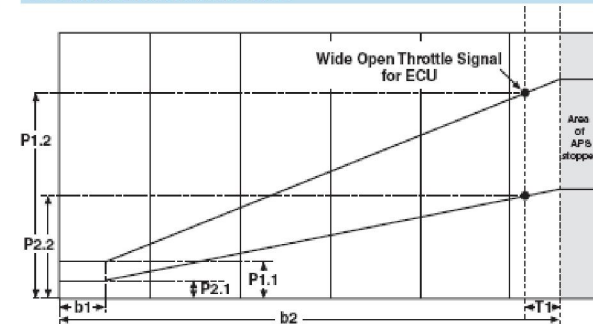
- Pin 1: 5 V supply: sensor 1
- Pin 2: Analogue signal: sensor 1
- Pin 3: Ground: sensor 1
- Pin 4: Ground: sensor 2
- Pin 5: Analogue signal: sensor 2
- Pin 6: 5 V supply: sensor 2

Mechanical characteristic curve



		Rated values
R	/[mm]	160.0
F1	/[N]	15.0 ± 3.5
F2	/[N]	25 ± 4.5
F4	/[N]	> 4.0
F5	/[N]	> 1.5
a1	/[degrees]	< 1.5
a2	/[degrees]	15.5

Electrical characteristic curve



		Rated values
b2	/[grad]	17 ± 1.0
P1.1	/[%]	15.0 ± 1.0
P2.1	/[%]	7.5 ± 1.0
P1.max	/[%]	< 81.8
P2.max	/[%]	< 40.9
P1.2	/[%]	76.8
P2.2	/[%]	38.4
T1	/[degrees]	< 2.0
b1	/[degrees]	< 1.2

Thank You for Your Attention!

